Topic: Distance between two points in three dimensions

Question: Calculate the distance between P_1 and P_2.

$$P_1 = (3,6,1)$$

$$P_2 = (0,1,5)$$

Answer choices:

A 5

B $5\sqrt{2}$

C $3\sqrt{5}$

D 7

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Solution: B

Plugging the points we've been given into the distance formula, we get

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(3 - 0)^2 + (6 - 1)^2 + (1 - 5)^2}$$

$$d = \sqrt{9 + 25 + 16}$$

$$d = \sqrt{50}$$

$$d = 5\sqrt{2}$$

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Topic: Distance between two points in three dimensions

Question: Calculate the distance between P_1 and P_2.

$$P_1 = (-5, -2, 6)$$

$$P_2 = (1, 2, 4)$$

Answer choices:

A $2\sqrt{14}$

B $2\sqrt{5}$

C 6

D $2\sqrt{10}$

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Solution: A

Plugging the points we've been given into the distance formula, we get

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(-5 - 1)^2 + (-2 - 2)^2 + (6 - 4)^2}$$

$$d = \sqrt{36 + 16 + 4}$$

$$d = \sqrt{56}$$

$$d = 2\sqrt{14}$$

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Topic: Distance between two points in three dimensions

Question: Find the value.

The distance between P_1 and P_2 is $3\sqrt{6}$. Find the value of z_2.

$$P_1 = (2,4,6)$$

$$P_2 = (5, -2, z_2)$$

Answer choices:

A 3

B 6

C 9

D 3 or 9

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Solution: D

Plugging the points we've been given into the distance formula, we get

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$3\sqrt{6} = \sqrt{(2 - 5)^2 + (4 - (-2))^2 + (6 - z_2)^2}$$

$$3\sqrt{6} = \sqrt{9 + 36 + 36 - 12z_2 + z_2^2}$$

$$3\sqrt{6} = \sqrt{81 - 12z_2 + z_2^2}$$

Square both sides and solve for z_2.

$$54 = 81 - 12z_2 + z_2^2$$

$$z_2^2 - 12z_2 + 27 = 0$$

$$(z_2 - 9)(z_2 - 3) = 0$$

$z_2 = 9$ or $z_2 = 3$

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